

What is claimed is:

1. An engine comprising:

a first camshaft having a power input portion at one end

5 thereof;

a second camshaft interlocked and connected with the first camshaft at one end portion thereof, the first and second camshaft having axes which are parallel with each other and are rotatably supported on a cylinder head;

10 a driven gear meshing with a drive gear provided at the other end portion of one of the first and second camshafts; and

15 an auxiliary device drive shaft connecting to an auxiliary device mounted on an engine main body including the cylinder head,

wherein an axis of the auxiliary device drive shaft is disposed between the first and second camshafts at a position being closer to the cylinder head than a straight line connecting the axes of the two camshafts.

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2. An engine comprising:

a first camshaft having a power input portion at one end thereof;

25 a second camshaft interlocked and connected with the first camshaft at one end portion thereof, the first and second camshaft having axes which are parallel with each other and are rotatably supported on a cylinder head;

a driven gear meshing with a drive gear provided at the other end portion of one of the first and second camshafts;

30 and

an auxiliary device drive shaft connecting to an auxiliary device mounted on an engine main body including the cylinder head,

wherein a bearing portion for rotatably supporting the auxiliary device drive shaft is provided on the cylinder head at a position where part of the bearing portion overlaps the drive gear as viewed in a direction directed along an axis of a cylinder, and

wherein a cut-out is formed in the bearing portion for avoiding an interference of the bearing portion with the drive gear.

3. An engine comprising:

a first camshaft having a power input portion at one end thereof;

a second camshaft interlocked and connected with the first camshaft at one end portion thereof, the first and second camshaft having axes which are parallel with each other and are rotatably supported on a cylinder head;

a driven gear meshing with a drive gear provided at the other end portion of one of the first and second camshafts; and

an auxiliary device drive shaft connecting to an auxiliary device mounted on an engine main body including the cylinder head,

wherein a bearing member provided at a position where part of the bearing member overlaps the drive gear as viewed in a direction directed along an axis of a cylinder for rotatably supporting the auxiliary device drive shaft is fixed to the cylinder head with a plurality of bolts, in that some of the

bolts are disposed so as to avoid positions where the bolts overlap the drive gear as viewed in the direction directed along the axis of the cylinder, whereas the remaining bolt is disposed at a position where the bolt overlaps the drive gear as viewed
5 in the direction directed along the axis of the cylinder, and
wherein a portion of an outer circumference of the drive gear which faces the remaining bolt is disposed between a first imaginary plane which passes through top surfaces of the some bolts and which are parallel with the axes of the two camshafts
10 and a second imaginary plane which passes through a top surface of the remaining bolt and which is parallel with the first imaginary plane.

4. An engine as set forth in Claim 1, wherein helical
15 gears meshing with each other are provided at the one end portions of the first and second camshafts, and

wherein a thrust generated in the camshaft of the two camshafts on which the drive gear is provided by virtue of the meshing engagement of the helical gears so provided and a thrust
20 generated in the camshaft on which the drive gear is provided by virtue of the meshing engagement of the drive gear and the driven gear which are both helical gears are set to be exerted in opposite directions to each other.

25 5. An engine as set forth in Claim 2, wherein helical gears meshing with each other are provided at the one end portions of the first and second camshafts, and

wherein a thrust generated in the camshaft of the two camshafts on which the drive gear is provided by virtue of the
30 meshing engagement of the helical gears so provided and a thrust

generated in the camshaft on which the drive gear is provided by virtue of the meshing engagement of the drive gear and the driven gear which are both helical gears are set to be exerted in opposite directions to each other.

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6. An engine as set forth in Claim 3, wherein helical gears meshing with each other are provided at the one end portions of the first and second camshafts, and

wherein a thrust generated in the camshaft of the two
10 camshafts on which the drive gear is provided by virtue of the meshing engagement of the helical gears so provided and a thrust generated in the camshaft on which the drive gear is provided by virtue of the meshing engagement of the drive gear and the driven gear which are both helical gears are set to be exerted
15 in opposite directions to each other.

7. An engine as set forth in Claim 1, wherein the first and second camshafts having axes which are parallel with each other along a cylinder arrangement direction are rotatably
20 supported by pluralities of first and second bearing portions, respectively, which are provided for the respective camshafts on a cylinder head at positions spaced apart from each other in the cylinder arrangement direction, in which first and second rotational wheels which are interlocked and connected with each
25 other are fixed to the first and second camshafts, respectively, at portions which protrude from the one endmost first and second bearing portions of the pluralities of the first and second bearing portions which are disposed at one end of the cylinder head along the cylinder arrangement direction, and in which
30 a cylindrical protruding portion which protrudes further

towards the one endmost bearing portion than the second rotational wheel is provided on the first rotational wheel, and

wherein the one endmost first bearing portion is disposed
5 so as to be offset in a direction in which the one endmost first bearing portion goes away from the first rotational wheel relative to the one endmost second bearing portion.

8. An engine as set forth in Claim 7, wherein a driven
10 gear which is the second rotational wheel is fixed to the second camshaft, and

wherein a drive gear which meshes with the driven gear and has the cylindrical protruding portion which protrudes further towards the one endmost first bearing portion than a
15 meshing portion with the driven gear, the drive gear being the first rotational wheel, and a sprocket which is disposed on an opposite side to the one endmost first bearing portion with respect to the drive gear and around which a cam chain is wound are fixed to the first camshaft.

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9. An engine as set forth in Claim 7, wherein pairs of inlet valve openings and pairs of exhaust valve openings which are all made to open to combustion chambers of cylinders, respectively, are provided in the cylinder head in such a manner
25 that each pair of inlet valve openings and each pair of exhaust valve openings are aligned in a direction directed along the axes of the two camshafts, and

wherein of the two exhaust valve openings or the two inlet valve openings which correspond to the first camshaft, the
30 exhaust valve opening or the inlet valve opening which is

situated closer to the one endmost first bearing portion is disposed so as to be offset towards an opposite direction to the first drive gear relative to the inlet valve opening or the exhaust valve opening situated closer to the one endmost 5 second bearing portion of the two inlet valve openings or the two exhaust valve openings which correspond to the second camshaft.

10. An engine as set forth in Claim 8, wherein pairs 10 of inlet valve openings and pairs of exhaust valve openings which are all made to open to combustion chambers of cylinders, respectively, are provided in the cylinder head in such a manner that each pair of inlet valve openings and each pair of exhaust valve openings are aligned in a direction directed along the 15 axes of the two camshafts, and

wherein of the two exhaust valve openings or the two inlet valve openings which correspond to the first camshaft, the exhaust valve opening or the inlet valve opening which is situated closer to the one endmost first bearing portion is 20 disposed so as to be offset towards an opposite direction to the first drive gear relative to the inlet valve opening or the exhaust valve opening situated closer to the one endmost second bearing portion of the two inlet valve openings or the two exhaust valve openings which correspond to the second 25 camshaft.

11. An engine as set forth in Claim 9, wherein the pair 30 of exhaust valve openings are provided on the cylinder head on a side thereof which corresponds to the first camshaft, and wherein an inlet port provided in the cylinder head in

such a manner as to communicate with the inlet valve opening situated closer to the one endmost second bearing portion of the pair of inlet valve openings which are provided on the cylinder head on a side thereof which corresponds to the second 5 camshaft is formed into a shape which can generate a swirl of charge within the corresponding combustion chamber.

12. An engine as set forth in Claim 10, wherein the pair of exhaust valve openings are provided on the cylinder head 10 on a side thereof which corresponds to the first camshaft, and wherein an inlet port provided in the cylinder head in such a manner as to communicate with the inlet valve opening situated closer to the one endmost second bearing portion of the pair of inlet valve openings which are provided on the 15 cylinder head on a side thereof which corresponds to the second camshaft is formed into a shape which can generate a swirl of charge within the corresponding combustion chamber.

13. An engine as set forth in Claim 7, wherein pluralities 20 of exhaust-side and inlet-side rocker arms which are pivot supported at one ends thereof in such a manner as to rock within planes which intersect at right angles with the axes of the two camshafts are interlocked and connected with exhaust valves and inlet valves at the other ends thereof, 25 wherein the respective bearing portions are made up of a lower cam holder having projections which are disposed on sides of the exhaust-side and inlet-side rocker arms to prevent the respective rocker arms from falling down and pluralities of exhaust-side and inlet-side upper cam holders which are all 30 fastened to the lower cam holder, and

wherein a space between the exhaust-side rocker arm adjacent to the one endmost first bearing portion and the one endmost first bearing portion is set to be narrower than a space between the inlet-side rocker arm adjacent to the one endmost 5 second bearing portion and the one endmost second bearing portion.

14. An engine as set forth in Claim 8, wherein pluralities of exhaust-side and inlet-side rocker arms which are pivot supported at one ends thereof in such a manner as to rock within 10 planes which intersect at right angles with the axes of the two camshafts are interlocked and connected with exhaust valves and inlet valves at the other ends thereof,

wherein the respective bearing portions are made up of 15 a lower cam holder having projections which are disposed on sides of the exhaust-side and inlet-side rocker arms to prevent the respective rocker arms from falling down and pluralities of exhaust-side and inlet-side upper cam holders which are all fastened to the lower cam holder, and

20 wherein a space between the exhaust-side rocker arm adjacent to the one endmost first bearing portion and the one endmost first bearing portion is set to be narrower than a space between the inlet-side rocker arm adjacent to the one endmost second bearing portion and the one endmost second bearing 25 portion.

15. An engine as set forth in Claim 9, wherein pluralities of exhaust-side and inlet-side rocker arms which are pivot supported at one ends thereof in such a manner as to rock within 30 planes which intersect at right angles with the axes of the

two camshafts are interlocked and connected with exhaust valves and inlet valves at the other ends thereof,

wherein the respective bearing portions are made up of a lower cam holder having projections which are disposed on 5 sides of the exhaust-side and inlet-side rocker arms to prevent the respective rocker arms from falling down and pluralities of exhaust-side and inlet-side upper cam holders which are all fastened to the lower cam holder, and

wherein a space between the exhaust-side rocker arm 10 adjacent to the one endmost first bearing portion and the one endmost first bearing portion is set to be narrower than a space between the inlet-side rocker arm adjacent to the one endmost second bearing portion and the one endmost second bearing portion.

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16. An engine as set forth in Claim 10, wherein pluralities of exhaust-side and inlet-side rocker arms which are pivot supported at one ends thereof in such a manner as to rock within planes which intersect at right angles with the 20 axes of the two camshafts are interlocked and connected with exhaust valves and inlet valves at the other ends thereof,

wherein the respective bearing portions are made up of a lower cam holder having projections which are disposed on 25 sides of the exhaust-side and inlet-side rocker arms to prevent the respective rocker arms from falling down and pluralities of exhaust-side and inlet-side upper cam holders which are all fastened to the lower cam holder, and

wherein a space between the exhaust-side rocker arm adjacent to the one endmost first bearing portion and the one 30 endmost first bearing portion is set to be narrower than a space

between the inlet-side rocker arm adjacent to the one endmost second bearing portion and the one endmost second bearing portion.

5 17. An engine as set forth in Claim 11, wherein pluralities of exhaust-side and inlet-side rocker arms which are pivot supported at one ends thereof in such a manner as to rock within planes which intersect at right angles with the axes of the two camshafts are interlocked and connected with
10 exhaust valves and inlet valves at the other ends thereof, wherein the respective bearing portions are made up of a lower cam holder having projections which are disposed on sides of the exhaust-side and inlet-side rocker arms to prevent the respective rocker arms from falling down and pluralities
15 of exhaust-side and inlet-side upper cam holders which are all fastened to the lower cam holder, and wherein a space between the exhaust-side rocker arm adjacent to the one endmost first bearing portion and the one endmost first bearing portion is set to be narrower than a space
20 between the inlet-side rocker arm adjacent to the one endmost second bearing portion and the one endmost second bearing portion.

18. An engine as set forth in Claim 12, wherein
25 pluralities of exhaust-side and inlet-side rocker arms which are pivot supported at one ends thereof in such a manner as to rock within planes which intersect at right angles with the axes of the two camshafts are interlocked and connected with exhaust valves and inlet valves at the other ends thereof,
30 wherein the respective bearing portions are made up of

a lower cam holder having projections which are disposed on sides of the exhaust-side and inlet-side rocker arms to prevent the respective rocker arms from falling down and pluralities of exhaust-side and inlet-side upper cam holders which are all 5 fastened to the lower cam holder, and

wherein a space between the exhaust-side rocker arm adjacent to the one endmost first bearing portion and the one endmost first bearing portion is set to be narrower than a space between the inlet-side rocker arm adjacent to the one endmost 10 second bearing portion and the one endmost second bearing portion.

19. An engine as set forth in Claim 13, wherein a side of the one endmost first bearing portion which faces the 15 protruding portion is disposed more inwardly in an axial direction of the first camshaft than a boss portion which is provided on the one endmost first bearing portion for allowing among a plurality of bolts used to fasten the lower cam holder to the cylinder head, a bolt corresponding to the one endmost 20 first bearing portion to pass therethrough.

20. An engine as set forth in Claim 14, wherein a side of the one endmost first bearing portion which faces the protruding portion is disposed more inwardly in an axial 25 direction of the first camshaft than a boss portion which is provided on the one endmost first bearing portion for allowing among a plurality of bolts used to fasten the lower cam holder to the cylinder head, a bolt corresponding to the one endmost first bearing portion to pass therethrough.

21. An engine as set forth in Claim 15, wherein a side
of the one endmost first bearing portion which faces the
protruding portion is disposed more inwardly in an axial
direction of the first camshaft than a boss portion which is
5 provided on the one endmost first bearing portion for allowing
among a plurality of bolts used to fasten the lower cam holder
to the cylinder head, a bolt corresponding to the one endmost
first bearing portion to pass therethrough.

10 22. An engine as set forth in Claim 16, wherein a side
of the one endmost first bearing portion which faces the
protruding portion is disposed more inwardly in an axial
direction of the first camshaft than a boss portion which is
provided on the one endmost first bearing portion for allowing
15 among a plurality of bolts used to fasten the lower cam holder
to the cylinder head, a bolt corresponding to the one endmost
first bearing portion to pass therethrough.

23. An engine as set forth in Claim 17, wherein a side
20 of the one endmost first bearing portion which faces the
protruding portion is disposed more inwardly in an axial
direction of the first camshaft than a boss portion which is
provided on the one endmost first bearing portion for allowing
among a plurality of bolts used to fasten the lower cam holder
25 to the cylinder head, a bolt corresponding to the one endmost
first bearing portion to pass therethrough.

24. An engine as set forth in Claim 18, wherein a side
of the one endmost first bearing portion which faces the
30 protruding portion is disposed more inwardly in an axial

direction of the first camshaft than a boss portion which is provided on the one endmost first bearing portion for allowing among a plurality of bolts used to fasten the lower cam holder to the cylinder head, a bolt corresponding to the one endmost 5 first bearing portion to pass therethrough.